**OXFORD CAMBRIDGE AND RSA EXAMINATIONS**

**AS GCE**

# 4751/01

# MATHEMATICS (MEI)

# Introduction to Advanced Mathematics (C1)

# QUESTION PAPER

**WEDNESDAY 18 MAY 2016: Morning**

**DURATION: 1 hour 30 minutes**
**plus your additional time allowance**

**MODIFIED ENLARGED**

**Candidates answer on the Printed Answer Book or any suitable paper provided by the centre. The centre may enlarge the Printed Answer Book.**

**OCR SUPPLIED MATERIALS:**

**Insert for question 9(iii)A**

**OTHER MATERIALS REQUIRED:**

**None**

**NO CALCULATOR CAN BE USED FOR THIS PAPER**

**READ INSTRUCTIONS OVERLEAF**

DC (NF/SG) 130401/2


* 6 4 8 8 4 3 1 6 5 7 *

## INSTRUCTIONS TO CANDIDATES

**Write your name, centre number and candidate number in the spaces provided on the Printed Answer Book or on the paper provided by the centre. Please write clearly and in capital letters.**

**IF YOU USE THE PRINTED ANSWER BOOK WRITE YOUR ANSWER TO EACH QUESTION IN THE SPACE PROVIDED IN THE PRINTED ANSWER BOOK. Additional paper may be used if necessary but you must clearly show your candidate number, centre number and question number(s).**

**Use black ink. HB pencil may be used for graphs and diagrams only.**

**Read each question carefully. Make sure you know what you have to do before starting your answer.**

**Answer ALL the questions.**

**You are NOT permitted to use a calculator in this paper.**

**Final answers should be given to a degree of accuracy appropriate to the context.**

## INFORMATION FOR CANDIDATES

**The number of marks is given in brackets [ ] at the end of each question or part question on the Question Paper.**

**You are advised that an answer may receive NO MARKS unless you show sufficient detail of the working to indicate that a correct method is being used.**

**The total number of marks for this paper is 72.**

**Any blank pages are indicated.**

## INSTRUCTION TO EXAMS OFFICER / INVIGILATOR

**Do not send this Question Paper for marking; it should be retained in the centre or recycled. Please contact OCR Copyright should you wish to re-use this document.**

## SECTION A (36 marks)

**1** Find the value of each of the following.

(i) $3^0$ [1]

(ii) $9^{\frac{3}{2}}$ [2]

(iii) $\left(\frac{4}{5}\right)^{-2}$ [2]

**2** Find the coordinates of the point of intersection of the lines $2x + 3y = 12$ and $y = 7 - 3x$. [4]

**3** (i) Solve the inequality $\frac{1-2x}{4} > 3$. [2]

(ii) Simplify $(5c^2d)^3 \times \frac{2c^4}{d^5}$. [2]

**4** You are given that $a = \frac{3c+2a}{2c-5}$. Express $a$ in terms of $c$. [4]

**5** (i) Express $\sqrt{50} + 3\sqrt{8}$ in the form $a\sqrt{b}$, where $a$ and $b$ are integers and $b$ is as small as possible. [2]

(ii) Express $\frac{5+2\sqrt{3}}{4-\sqrt{3}}$ in the form $c + d\sqrt{3}$, where $c$ and $d$ are integers. [3]

**6** Find the binomial expansion of $(1 - 5x)^4$, expressing the terms as simply as possible. [4]

**7 (i) Solve the equation $(x - 2)^2 = 9$. [2]**

**(ii) Sketch the curve $y = (x - 2)^2 - 9$, showing the coordinates of its intersections with the axes and its turning point. [3]**

**8 You are given that $f(x) = x^3 + ax + c$ and that $f(2) = 11$. The remainder when $f(x)$ is divided by $(x + 1)$ is 8. Find the values of $a$ and $c$. [5]**

**SECTION B (36 marks)**

**9** Fig. 9 opposite shows the curves $y = \frac{1}{x+2}$ and $y = x^2 + 7x + 7$.

**(i)** Use Fig. 9 to estimate graphically the roots of the equation $\frac{1}{x+2} = x^2 + 7x + 7$ . [2]

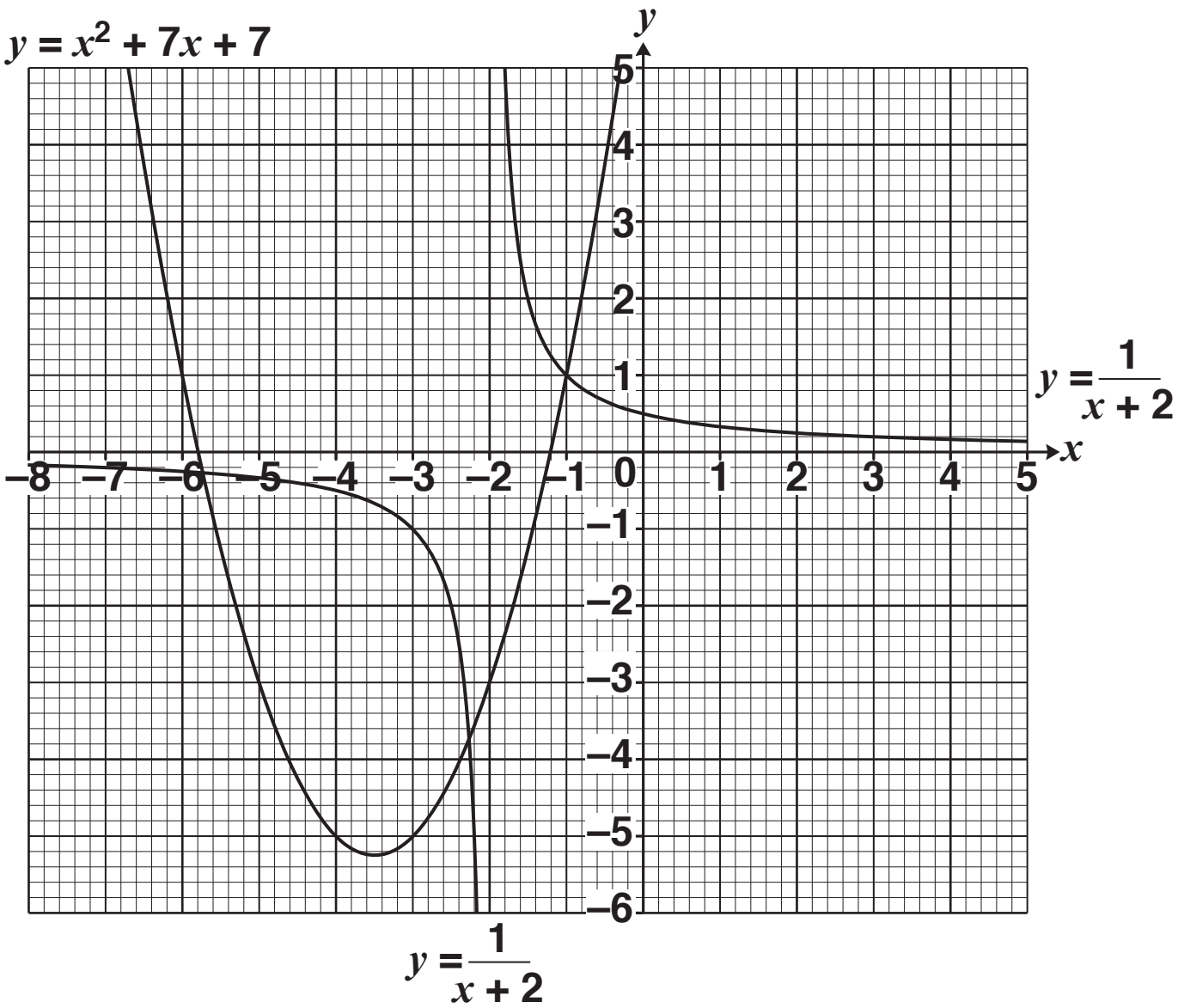
**(ii)** Show that the equation in part (i) may be simplified to $x^3 + 9x^2 + 21x + 13 = 0$. Find algebraically the exact roots of this equation. [7]

**(iii)** The curve $y = x^2 + 7x + 7$ is translated by $\begin{pmatrix} 3 \\ 0 \end{pmatrix}$.

**(A)** Show graphically that the translated curve intersects the curve $y = \frac{1}{x+2}$ at only one point. Estimate the coordinates of this point. [2]

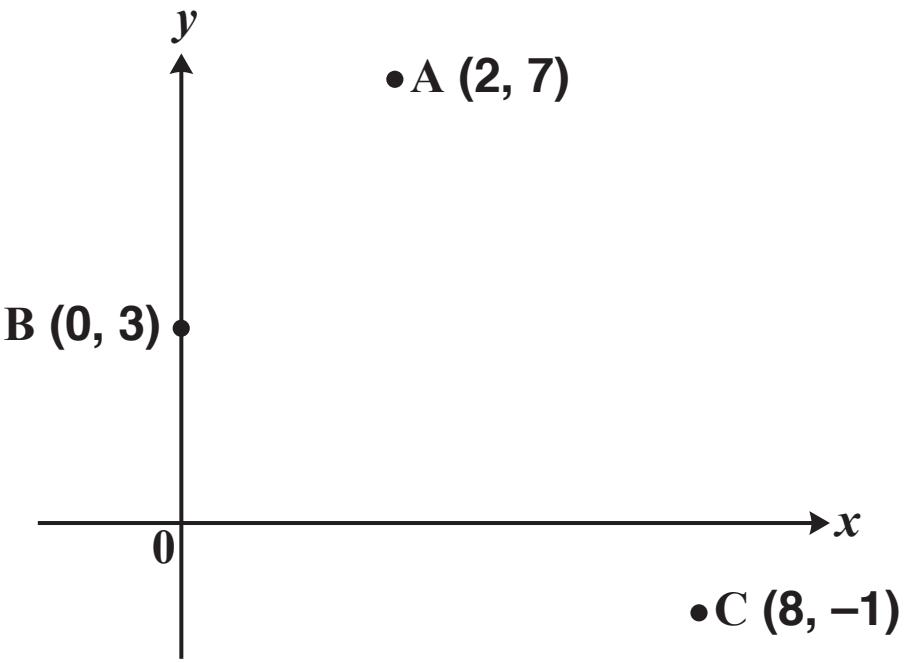
**(B)** Find the equation of the translated curve, simplifying your answer. [2]

FIG. 9



10 Fig. 10 shows a sketch of the points A (2, 7), B (0, 3) and C (8, −1).

FIG. 10




(i) Prove that angle ABC is 90°. [3]

(ii) Find the equation of the circle which has AC as a diameter. [4]

(iii) Find the equation of the tangent to this circle at A. Give your answer in the form $ay = bx + c$, where $a$, $b$ and $c$ are integers. [4]

**11 (i) Find the coordinates of the points of intersection of the curve $y = 2x^2 - 5x - 3$ with the axes. [3]**

**(ii) Find the coordinates of the points of intersection of the curve $y = 2x^2 - 5x - 3$ and the line $y = x + 3$. [4]**

**(iii) Find the set of values of $k$ for which the line $y = x + k$ does not intersect the curve $y = 2x^2 - 5x - 3$. [5]**

**END OF QUESTION PAPER**

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